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Temmink

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[54] **APPARATUS FOR TRANSFERRING SEPARATE PRODUCTS, SUCH AS EGGS AND FRUIT, FROM A FEED CONVEYOR TO A PACKAGING APPARATUS**

5,101,954 4/1992 Nambu 198/370.04
5,160,019 11/1992 Temming 198/803.9
5,167,317 12/1992 Van Der Schoot et al. 198/469.1
5,168,977 12/1992 van Essen et al. .
5,232,080 8/1993 Van Essen et al. 198/418.6

[75] Inventor: **Leonardus Johannes Temmink**,
Aalten, Netherlands

FOREIGN PATENT DOCUMENTS

[73] Assignee: **FPS Food Processing Systems B.V.**,
Netherlands

98733 1/1984 European Pat. Off. .
0 517 342 12/1992 European Pat. Off. .
0143112 6/1988 Japan .

[21] Appl. No.: **08/786,135**

Primary Examiner—Johnny D. Cherry
Assistant Examiner—Steven B. McAllister
Attorney, Agent, or Firm—Larson & Taylor

[22] Filed: **Jan. 21, 1997**

[30] **Foreign Application Priority Data**

[57] **ABSTRACT**

Dec. 13, 1996 [NL] Netherlands 1004779

[51] **Int. Cl.**⁶ **B65G 47/30**

An apparatus for transferring separate products, such as eggs and fruit, from a feed conveyor to a packaging apparatus includes a feed conveyor provided with at least one row of product holders, a receiving conveyor provided with brushes for receiving the products discharged from the feed conveyor and a feed-through conveyor connecting to the receiving conveyor for further conveying the products to a packaging apparatus. The apparatus is provided with electrically operable discharge members disposed above the feed conveyor. The fall trajectory of the articles discharged from the feed conveyor is such that the articles end up at substantially the same landing location on the receiving conveyor, independently of the speed of travel of the feed conveyor at the moment of discharge.

[52] **U.S. Cl.** **198/418.6**; 198/432; 198/440;
198/445; 198/534; 198/370.03

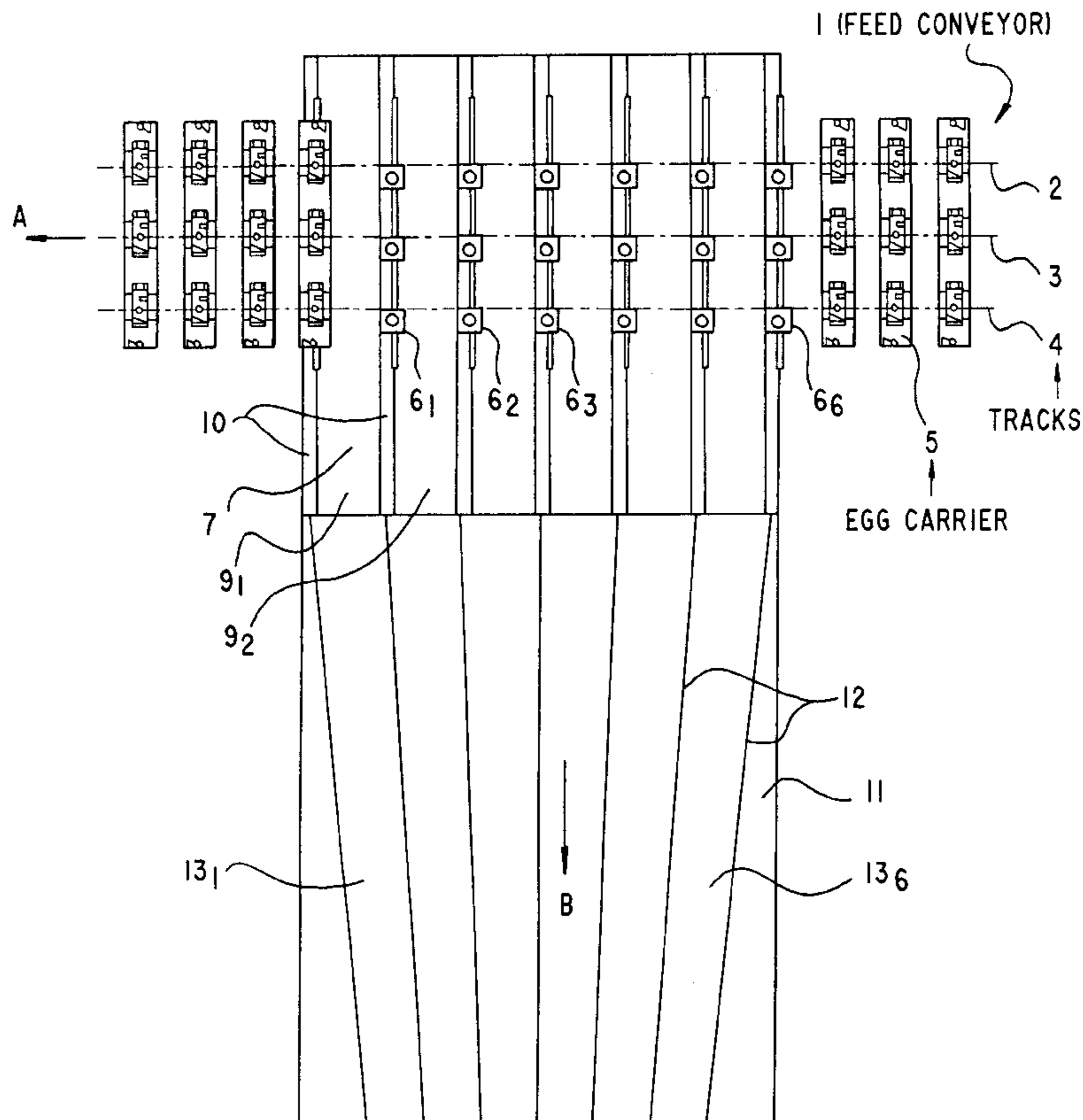
[58] **Field of Search** 198/370.03, 370.04,
198/370.05, 418.6, 432, 440, 458, 534,
836.3, 445; 209/510

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,224,579 12/1965 Scollard et al. 209/514
4,049,111 9/1977 Mosterd 198/445
4,487,321 12/1984 Bliss 209/510
4,776,465 10/1988 McEvoy et al. .
5,086,909 2/1992 Powell, Jr. 198/534

5 Claims, 6 Drawing Sheets



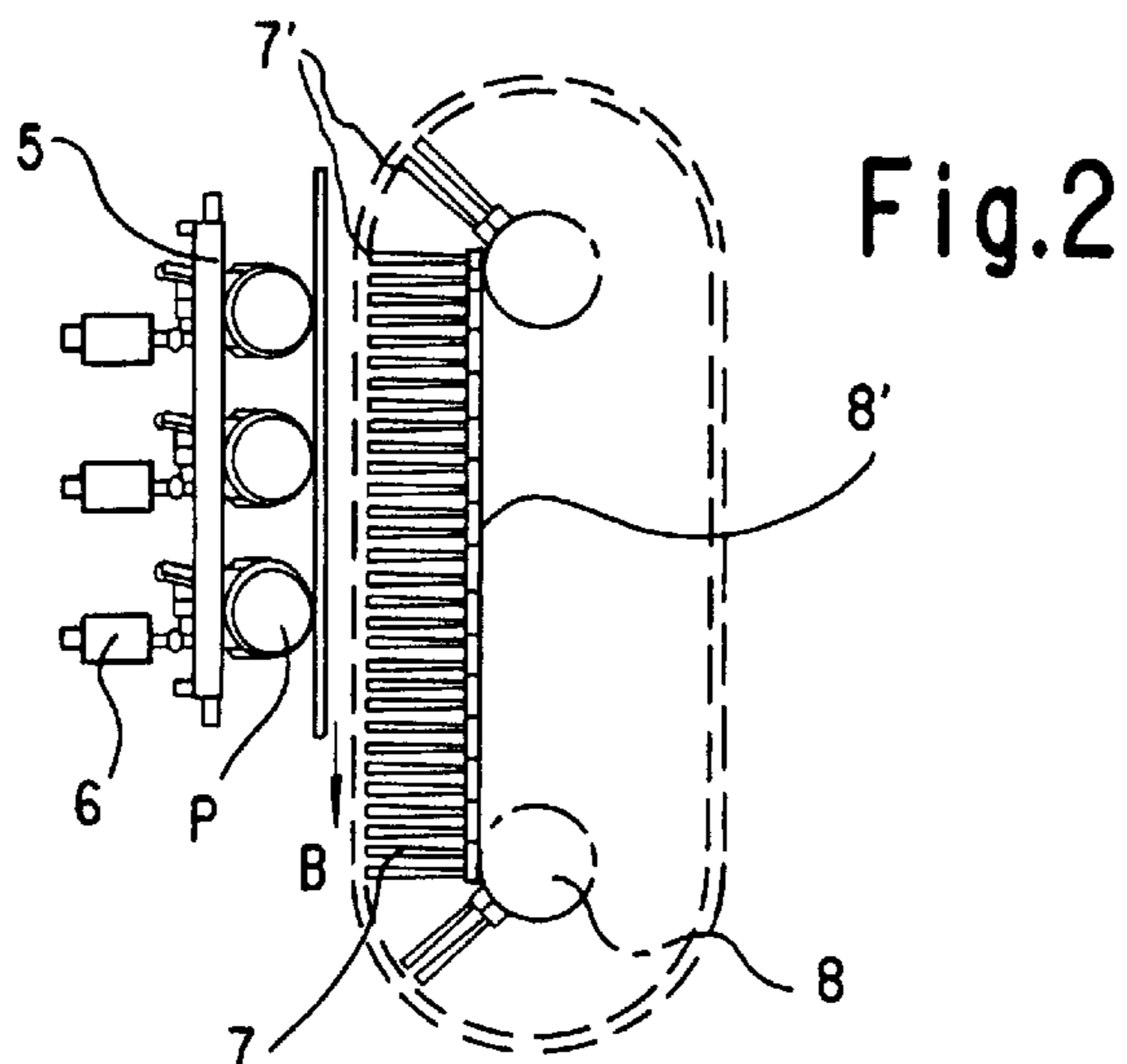
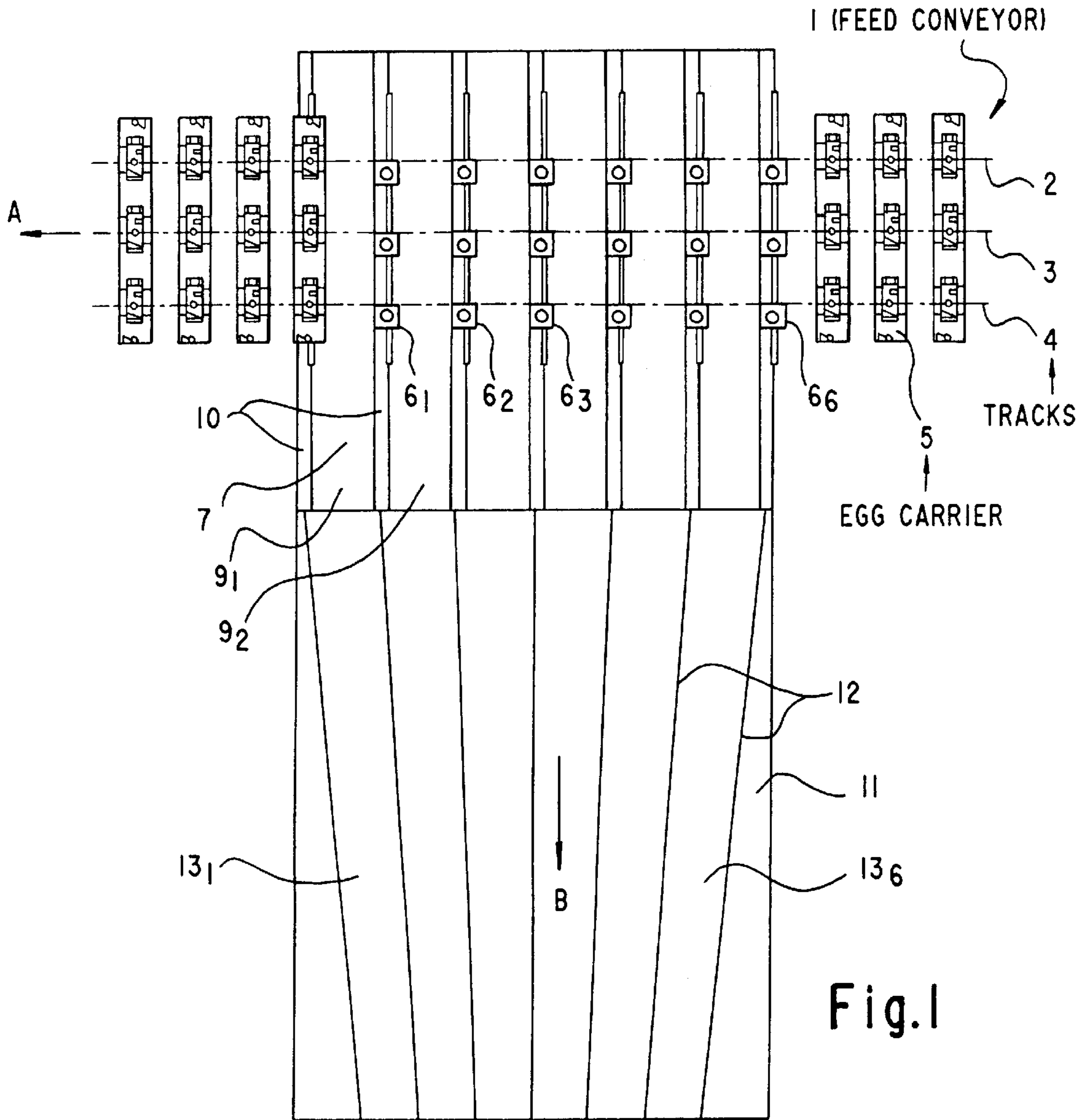


Fig.3

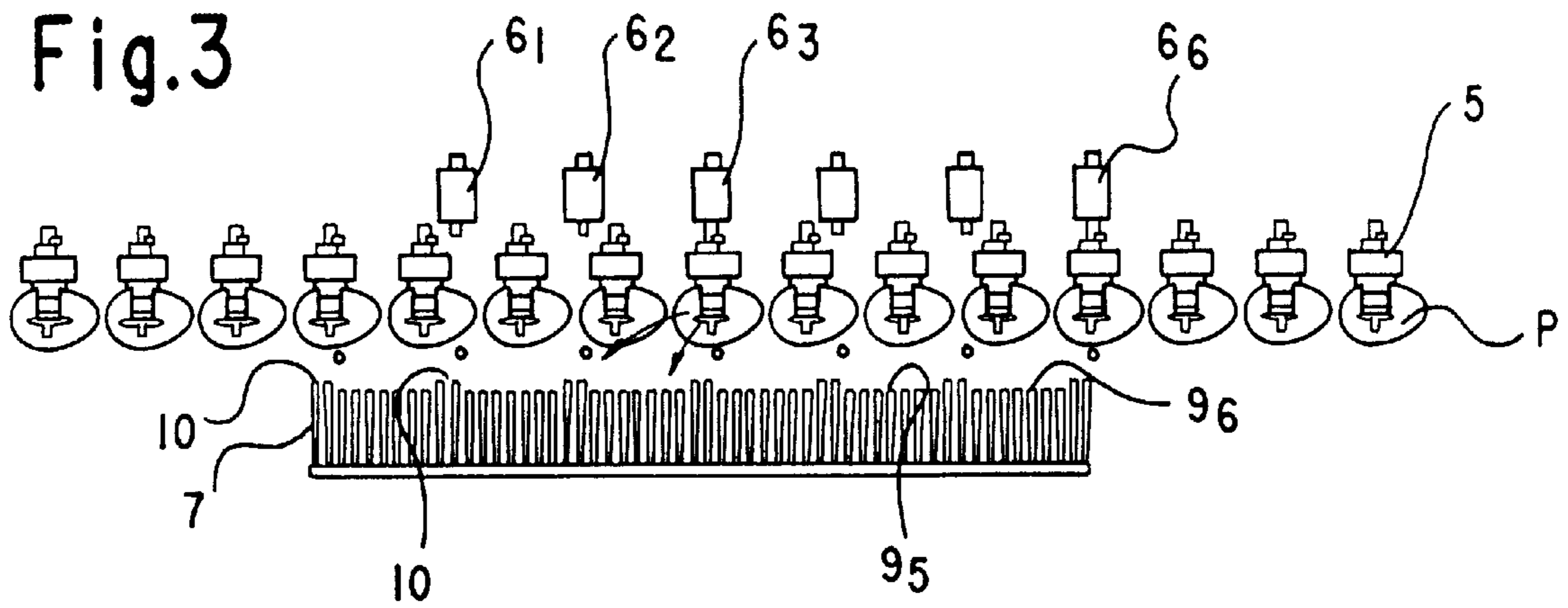


Fig.4

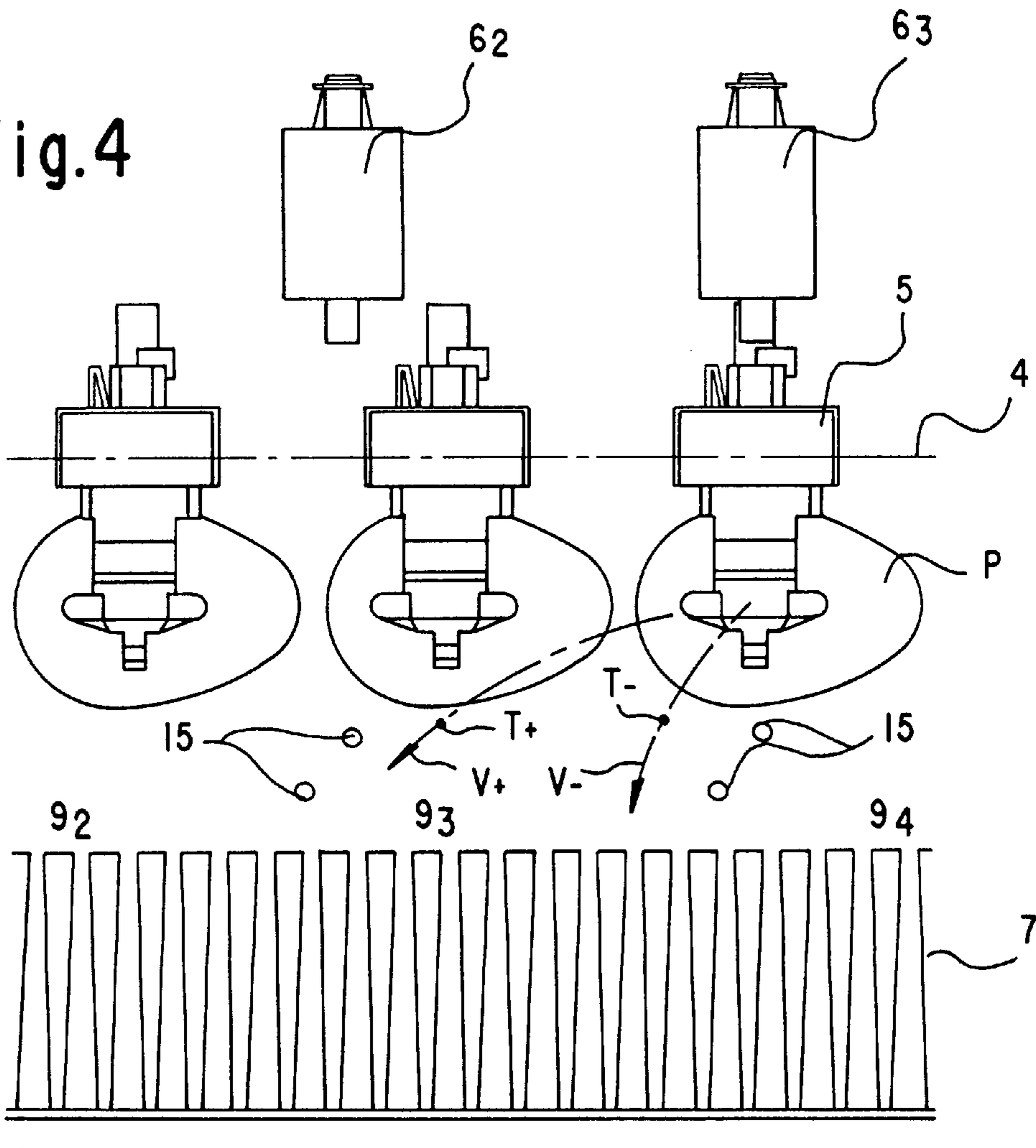


Fig.5

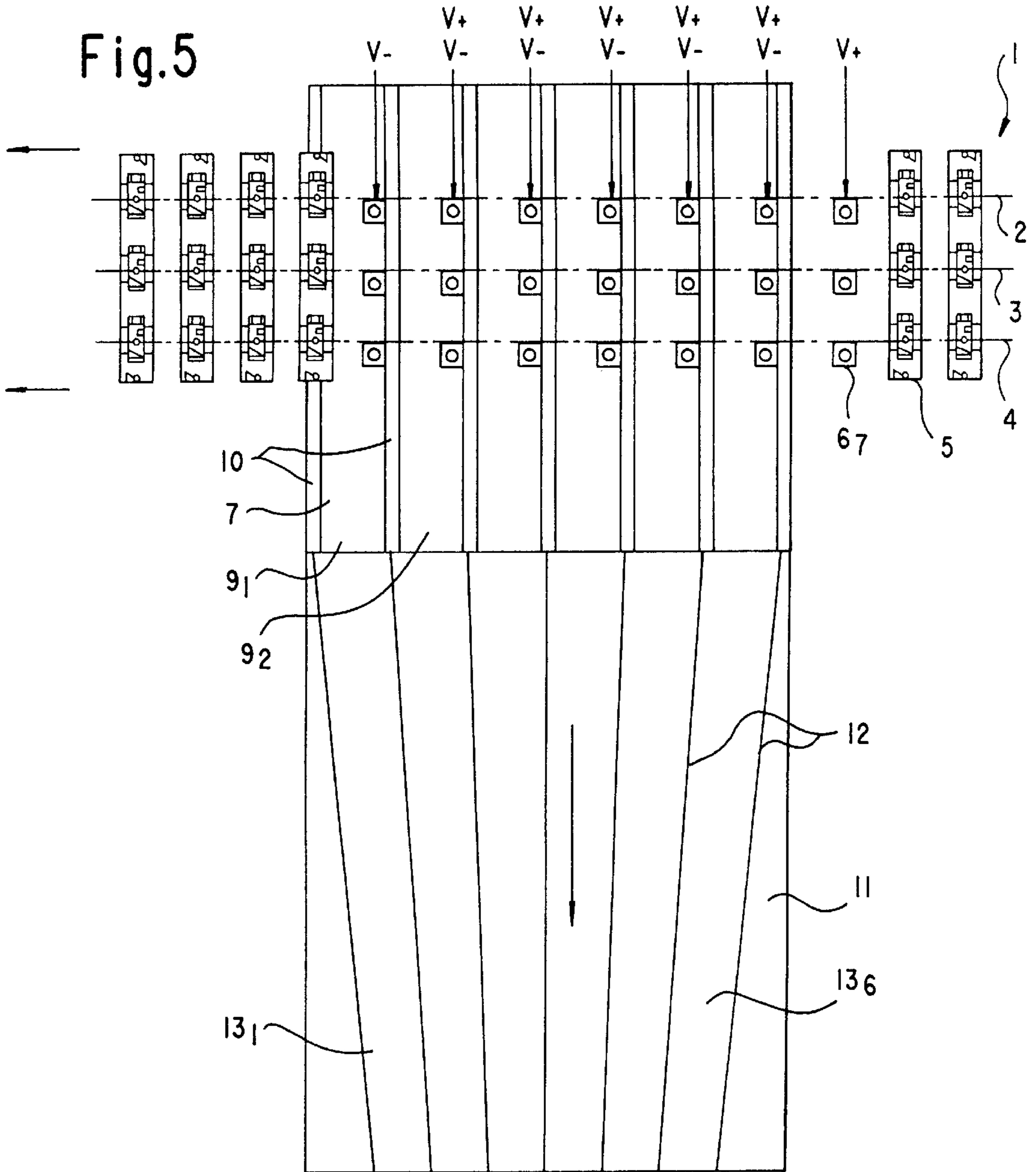


Fig.6

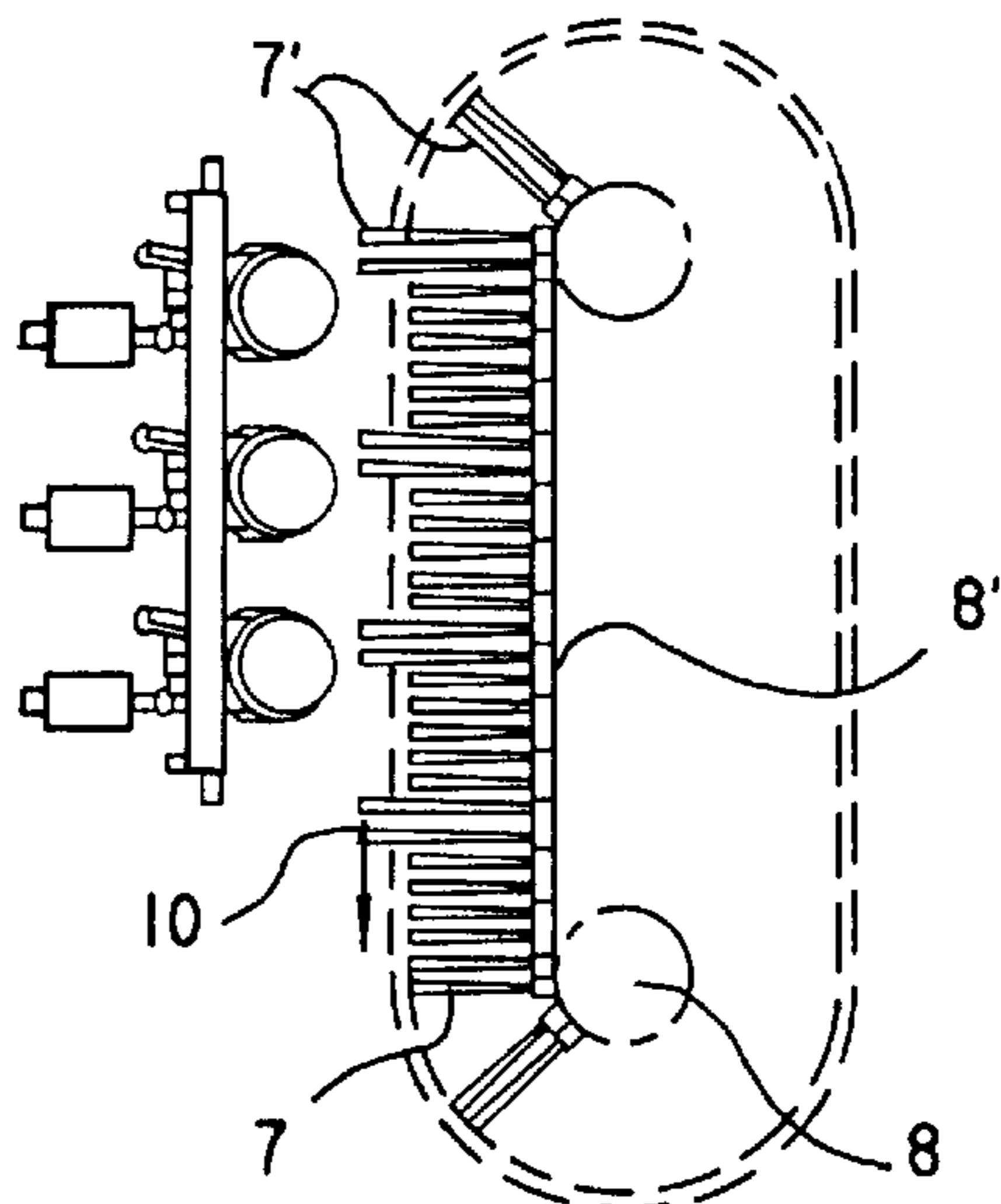


Fig.7

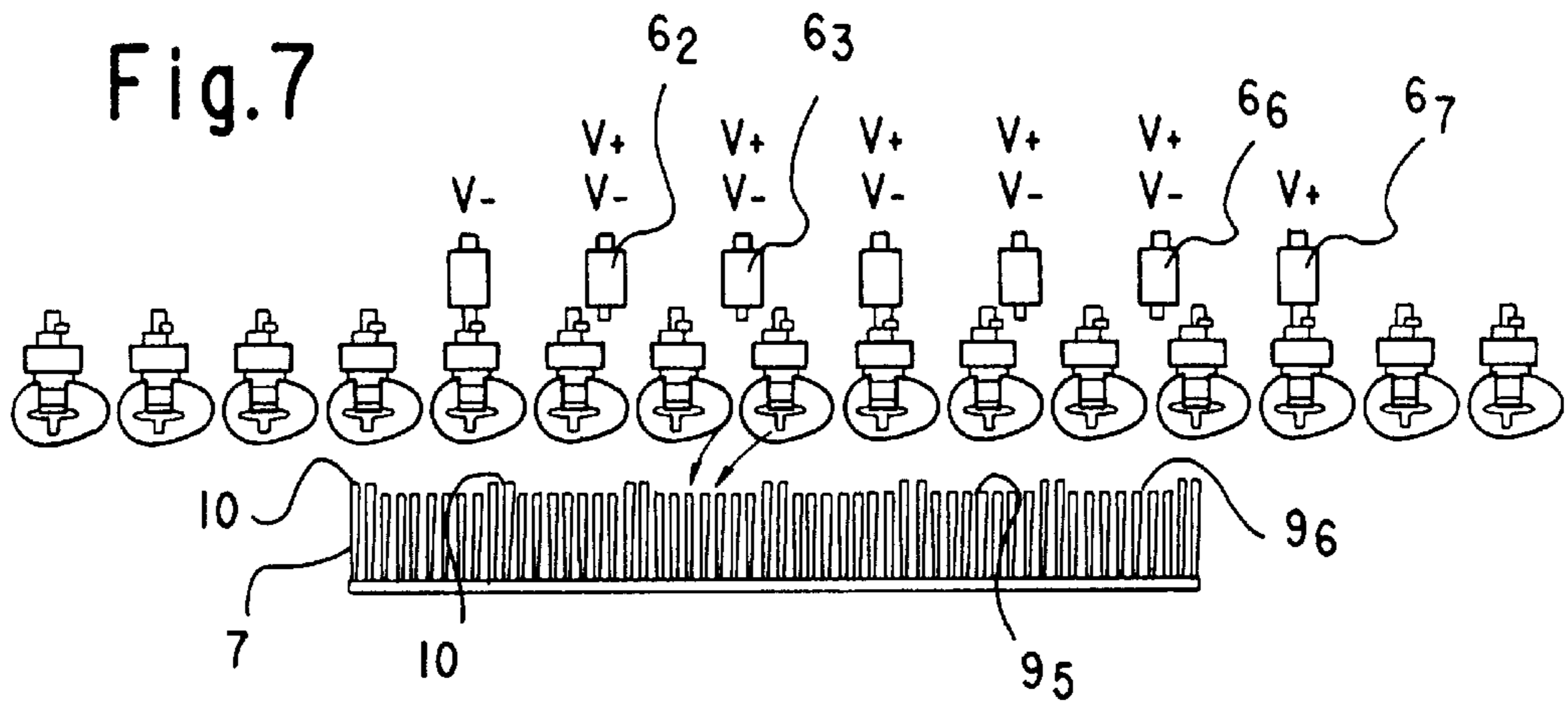
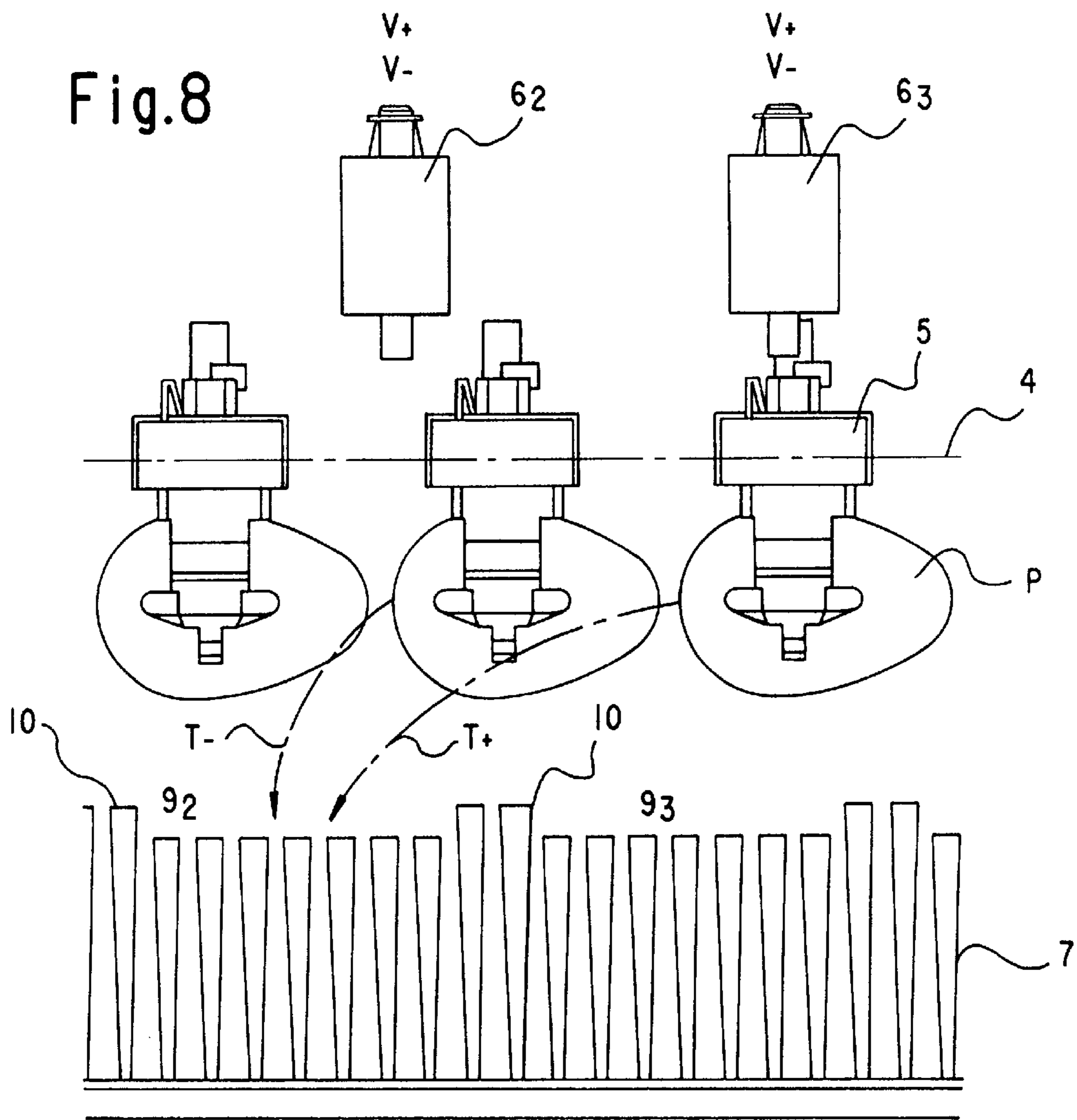


Fig.8



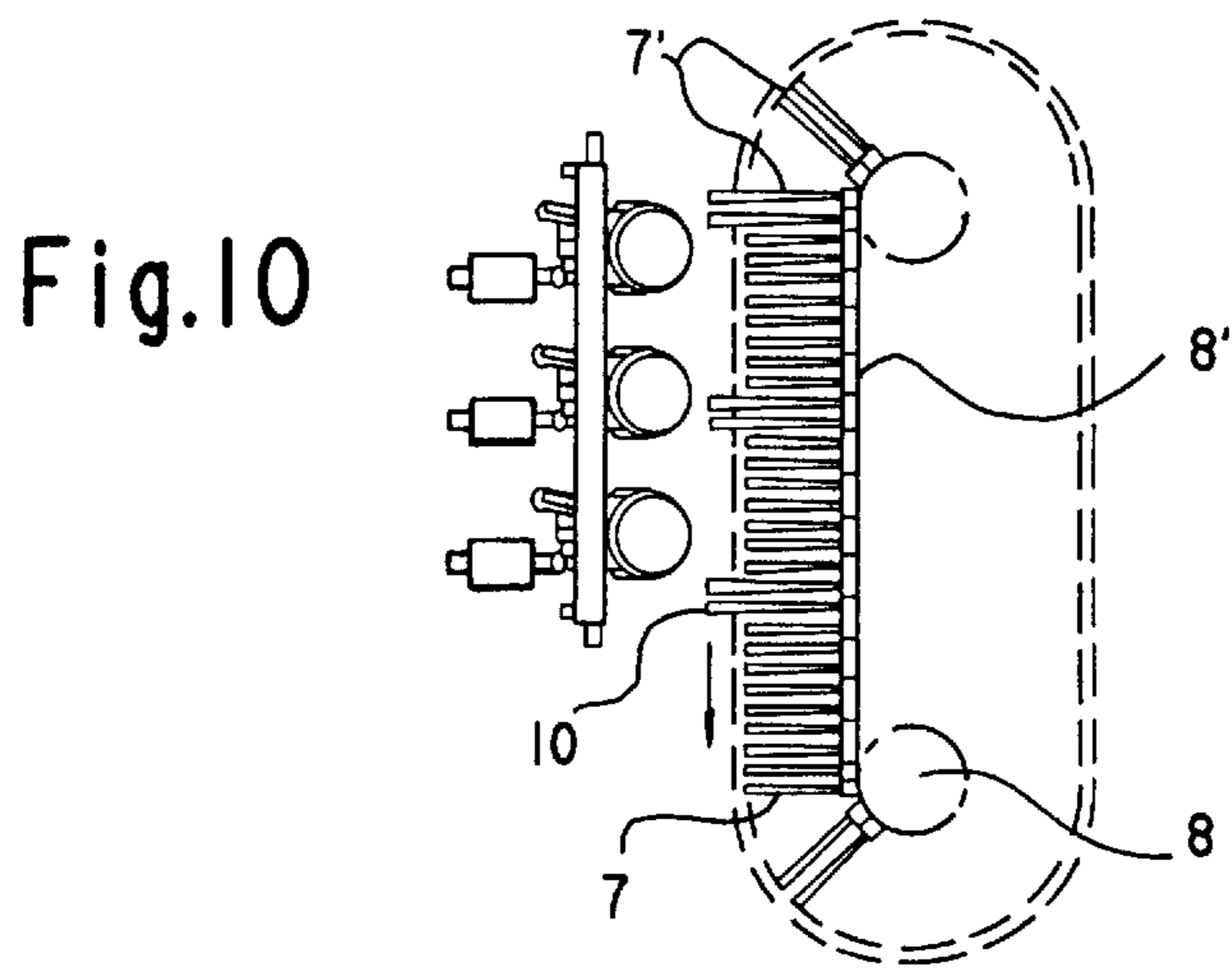
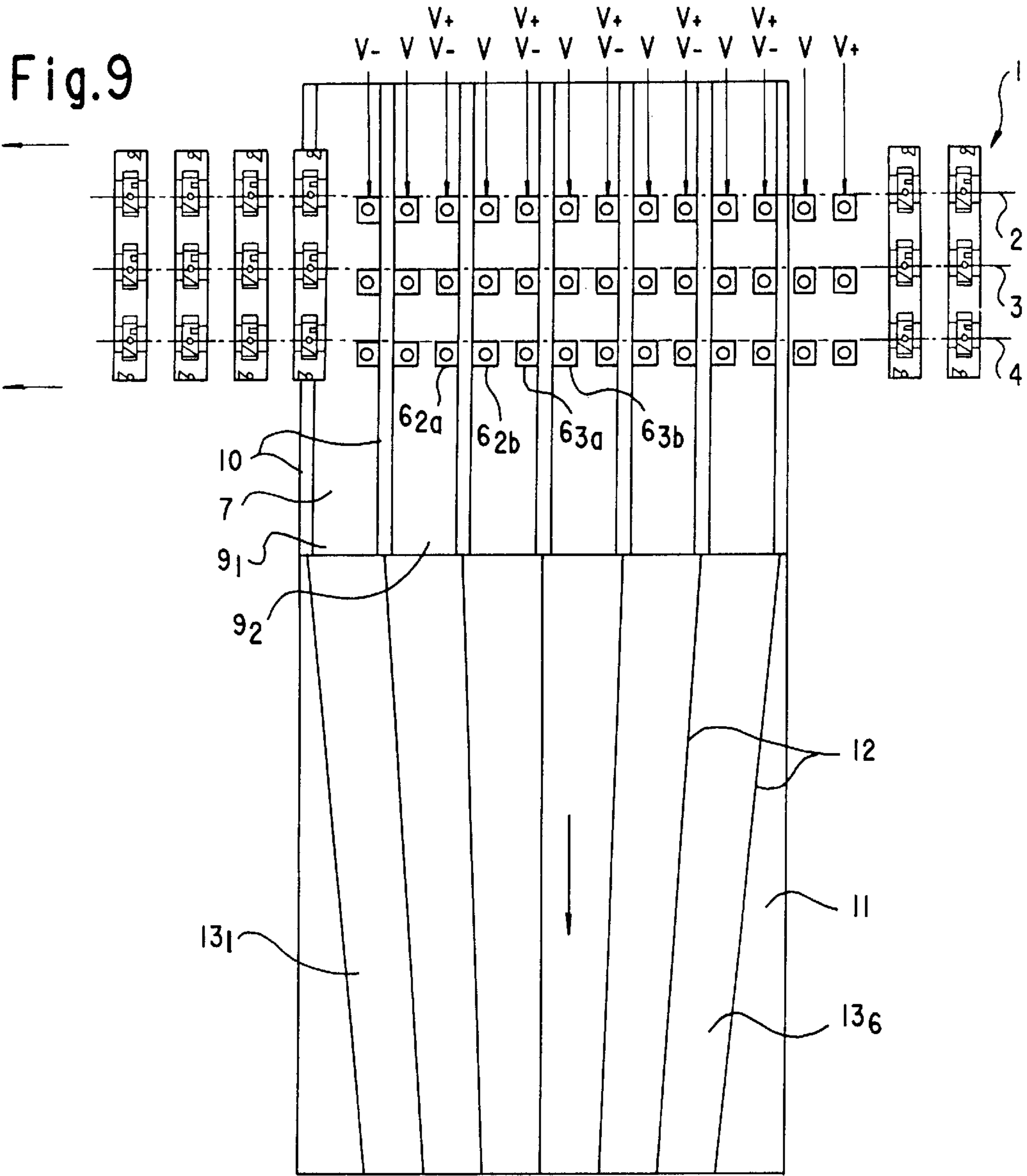


Fig. 11

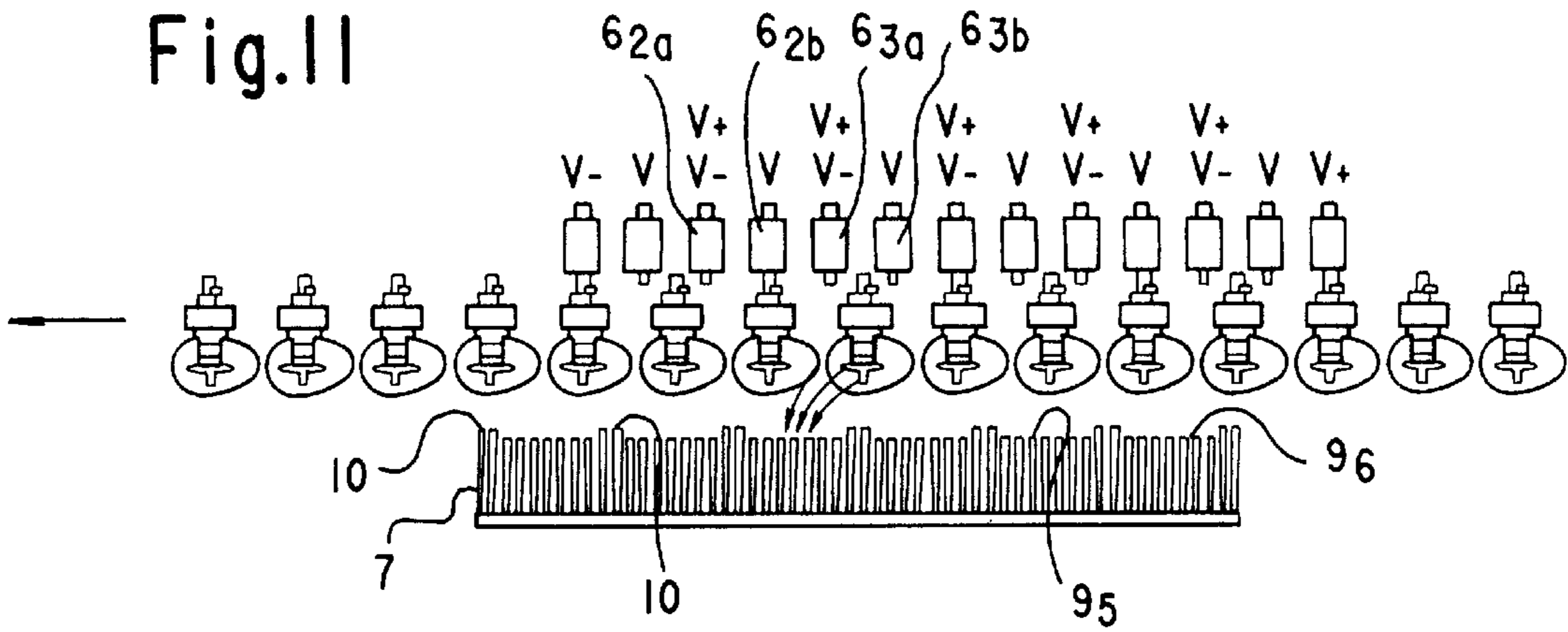
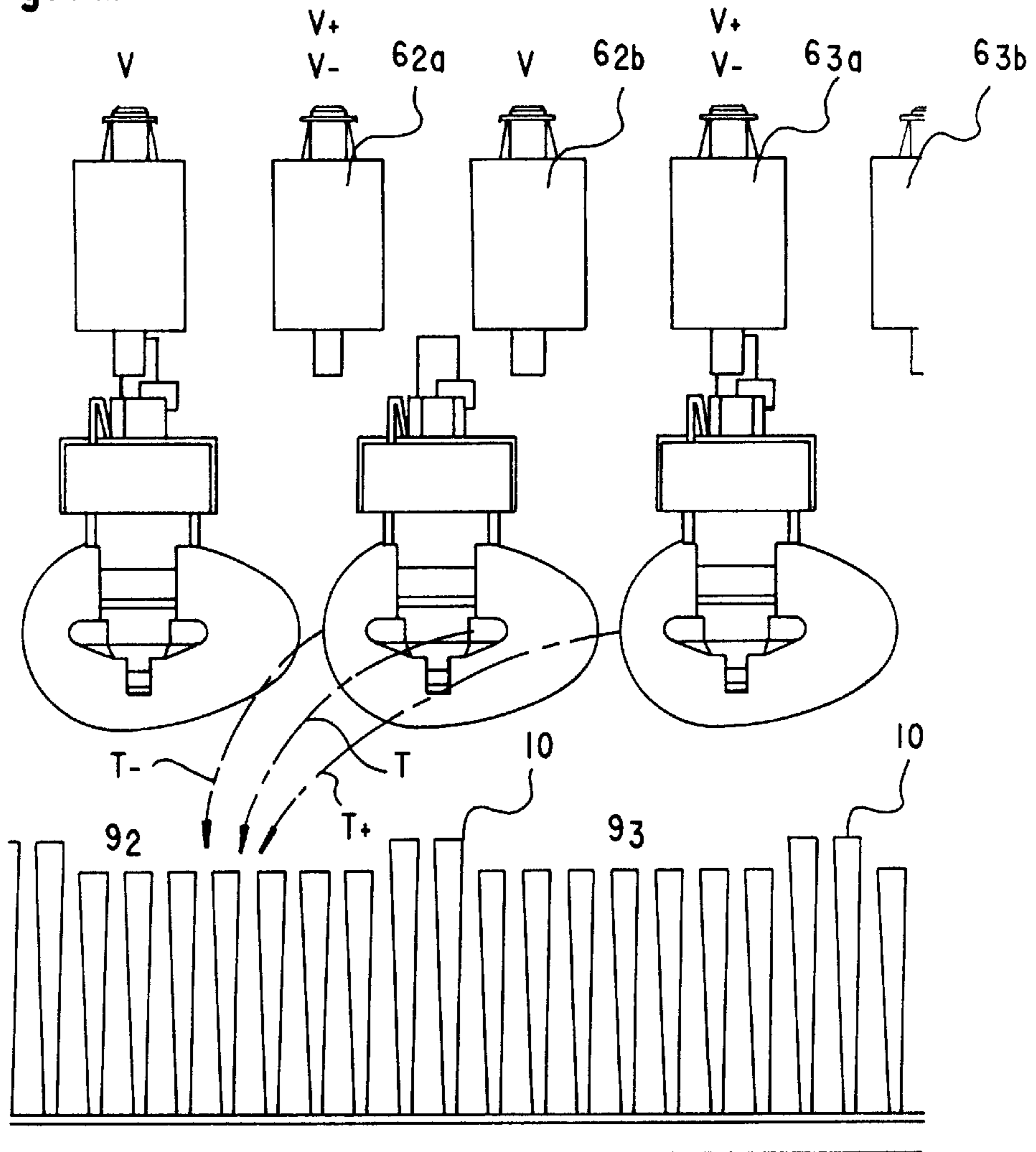


Fig. 12



**APPARATUS FOR TRANSFERRING
SEPARATE PRODUCTS, SUCH AS EGGS
AND FRUIT, FROM A FEED CONVEYOR TO
A PACKAGING APPARATUS**

FIELD OF THE INVENTION

The invention relates to an apparatus for transferring separate products, such as eggs and fruit, from a feed conveyor to a packaging apparatus, which apparatus comprises: a feed conveyor provided with a least one row of product holders, which product holders are spaced apart in the direction of movement of the feed conveyor; a receiving conveyor provided with brushes, for receiving the products discharged from the feed conveyor, which receiving conveyor is arranged under the feed conveyor and whose direction of movement is perpendicular to that of the feed conveyor; and a feed-through conveyor, connecting to the receiving conveyor, for further conveying the products to a packaging apparatus.

BACKGROUND OF THE INVENTION

Such an apparatus is known from U.S. Pat. No. 5,167,317 and usually forms part of a receiving station of a product-sorting apparatus. Connected to such a sorting apparatus are as many receiving stations as there are weight or quality classes wherein the products are to be sorted by the sorting apparatus.

Sorting apparatuses can be set at different operating speeds, depending on the desired treatment capacity. The products discharged from the main or feed conveyor of the sorting apparatus traverse a fall trajectory which depends on the speed of travel of this main conveyor. Also during the starting and stopping of the main conveyor, changes occur in the fall trajectory traversed by the discharged products. To enable the discharged products to be received at the same location, independently of the speed at the moment of discharge, the discharging moment of the products should be advanced when the speed of travel of the main conveyor increases, or postponed with its speed decreases. A solution to this problem is known from, inter alia, EP-B-0.098.733, which describes a container disposed above the main conveyor and containing electrically operable discharge members, which, when energized, provide for the discharge of a product from a product carrier of the main conveyor. Via a linearly slidable bar, the container with discharge members is displaceable in the direction of movement of the main conveyor, or opposite thereto, which slidable bar is driven by a driving mechanism directly coupled to the drive motor for the main conveyor.

SUMMARY OF THE INVENTION

The object of the invention is to provide a simplified solution to the problem of the speed compensation during the discharge of products from the main conveyor, which solution makes it possible in particular to omit the driving mechanism, coupled to the drive motor of the main conveyor, for the slidable container with discharge members, and to eliminate the wiring moving along with that container with discharge members.

To that end, the invention provides an apparatus provided with electrically operable discharge members disposed above the feed conveyor, which discharge members are fixedly arranged, while, further, means are present for operating these discharge members, respectively for influencing the fall trajectory of the articles discharged from the feed

conveyor. the arrangement being such that these articles end up on the receiving conveyor at substantially the same landing location, independently of the speed of travel of the feed conveyor at the moment of discharge.

In accordance with a preferably used embodiment of the apparatus according to the invention, the top face of the receiving conveyor is divided, by means of elastic ropes stretched at a short distance above that top face and extending in the direction of movement of the receiving conveyor, into parallel channels, while the number of discharge members of the feed conveyor per track is equal to that number of channels and each channel serves as landing location for products discharged from a fixed discharge member associated with that channel, which ropes form the means for influencing the fall trajectory of the articles discharged from the feed conveyor. These ropes provide that the fall trajectory of products discharged at low or high speeds is changed so that these products end up in a controlled manner in the channel of the receiving belt associated with the discharge member of that channel.

Instead of the fall trajectory of the eggs discharged, in accordance with another embodiment, the fixed discharge members can be controlled so that at a low speed, the discharge member of a channel of the receiving belt associated with that discharge member is energized, while at high speeds, the upstream discharge member associated with the preceding channel of the receiving belt is energized, so that the product discharged at high speed ends up in the proper channel of the receiving belt all the same. Instead of two speed-dependently operable discharge members per channel, it is also possible to use three or more speed-dependently operable discharge members per channel.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the apparatus according to the invention are specified hereinafter with reference to the accompanying drawings, wherein:

FIG. 1 is a top plan view of an apparatus according to the invention according to a first embodiment;

FIG. 2 is a side elevation of the apparatus according to FIG. 1;

FIG. 3 is a front view of the apparatus according to FIG. 1;

FIG. 4 is a detail of FIG. 3, shown to an enlarged scale;

FIGS. 5-7 are views according to FIGS. 1-3 of a second embodiment;

FIG. 8 is a detail of the view according to FIG. 7, shown to an enlarged scale;

FIGS. 9-11 are views according to FIGS. 1-3 of a third embodiment; and

FIG. 12 is a detail of the view according to FIG. 11, shown to an enlarged scale.

DETAILED DESCRIPTION OF THE
PREFERRED EMBODIMENTS OF THE
INVENTION

In FIG. 1, a main or feed conveyor 1 consisting of three separate, parallel tracks 2, 3 and 4 is shown in dotted lines. The tracks 2, 3 and 4 are each provided with product holders or egg carriers 5 respectively, spaced apart in the direction of movement A. The products or eggs P can be discharged from the egg carriers 5 by means of electrically operable discharge members 6 which are disposed above the feed conveyor 1 and which can be energized at the desired

moment and open the egg carrier 5 at that moment, whereupon the egg P is discharged.

Disposed under the feed conveyor 1 is a receiving conveyor 7 whose direction of movement is indicated by arrow B. The receiving conveyor 7 is built up of brushes 7' whose brush hairs are perpendicular to the top face of the receiving conveyor 7. The top face of the receiving conveyor 7 is divided into channels 9 which extend in the direction of movement B and which are in parallel juxtaposition. The sidewalls of the channels 9 are formed by elastic ropes 15 stretched at a short distance above the top face of the receiving conveyor 7 (see FIG. 4), or by extended brush hairs 10 (see FIG. 8), or, optionally, by a combination of the two means 10, 15. The width of each channel 9 is somewhat greater than the greatest longitudinal dimension of the eggs P to be sorted. The hairs of 7' the brushes of the receiving conveyor 7 are provided on brush strips that are coupled together and connected to a series of parallel, endless chains 8' stretched over two chain wheels 8 and drivable by means of a driving shaft not shown.

Connecting to the receiving or brush conveyor 7 is a feed-through conveyor 11, which is movable in the same direction B and conveys the eggs taken over from the conveyor 7 to a packaging apparatus, not shown, disposed downstream of the feed-through conveyor 11. Provided above the top face of the feed-through conveyor 11 are a number of guide strips 12 whose ends proximal to the receiving conveyor 7 abut to the elastic ropes 15 or the raised brush edges 10 of the channels 9 of the receiving conveyor 7. Between each pair of guide strips 12 a channel 13 is located whose width decreases in the direction of movement B in order that the mutual pitch distance of the eggs can be adapted to the smaller pitch distance of the packaging apparatus.

In the detail shown to an enlarged scale in FIG. 4, two discharge members 6₂ and 6₃ are shown, associated with the channels 9₂ and 9₃ of the receiving or brush conveyor 7. Extending under these discharge members is track 4 of the feed conveyor 1, and the discharge members 6₂ and 6₃ can, when energized, open an egg carrier 5, whereupon the egg is discharged. The discharge members 6₂ and 6₃ are located approximately vertically above the upstream edges of the channels 9₂ and 9₃ or above the stretched elastic ropes 15. In FIG. 4, the situation is shown wherein the discharge member 6₃ is energized and the egg P included in the egg carrier 5 is discharged. Depending on the position of the discharge member 6₃ relative to the associated channel 9₃ of the brush belt 7, three situations can occur:

At very low speeds, for instance during the start of the feed conveyor, an egg P discharged by the discharge member 6₃ falls down vertically, after which this egg, in the absence of the elastic ropes 15, could tilt in the direction of the channel 9₄ of the brush belt 7. When the speed of the feed conveyor further increases, the landing location of the discharged egg P will shift leftwards and, consequently, the discharged egg will end up in the channel 9₃ associated with the discharge member 6₃. When the speed of the feed conveyor 1 increases still further, the landing location of the egg P will shift still further leftwards relative to the discharge point and the egg may end up in the channel 9₂ of the brush belt 7. Hence, the distribution in landing locations of eggs P discharged by means of the stationary discharge member 6₃ is considerably greater than the width of a brush channel 9₂, 9₃ etc.

To ensure that all eggs P discharged by means of the discharge member 6₃ end up in the associated brush channel

9₃, elastic ropes 15 are stretched at a short distance above the top face of the brush belt 7, which ropes provide that the eggs P discharged by the discharge member 6₃ at low speed receive a little push, causing them to tilt in the direction of the brush channel 9₃, while the eggs discharged at high speed, whose fall trajectory would end in the brush channel 9₂, are retained or tilted in the direction of the brush channel 9₃ by one or more other elastic ropes 15. Through a proper choice of the positioning of the discharge member 6₃ and of the elastic ropes 15 relative to the edges of the brush channel 9₃, it is thus realized that all eggs discharged by the discharge member 6₃ end up in the brush channel 9₃, independently of the speed of travel at the moment of discharge. Particularly in order to prevent shooting through of eggs P discharged at higher speed, each sidewall of a channel 9₂, 9₃ preferably consists of two ropes 15, arranged one obliquely above to other, as shown in FIG. 4.

By way of illustration, FIG. 4 shows two fall trajectories of an egg P, of which the fall trajectory T- is associated with a low speed V- of the feed conveyor 1. The eggs which, during discharging, follow a fall trajectory T- will fall on the pair of ropes 15 shown to the right of that fall trajectory, and will be deflected leftwards thereby. The eggs P discharged at a speed of travel V+ of the feed conveyor 1 and following the fall trajectory T+ will contact the pair of ropes 15 shown to the left in FIG. 4, and will thereby be received and tilted in the direction of the brush channel 9₃.

A structural variant shown in FIGS. 5-7 substantially corresponds to the one shown in FIGS. 1-3, the only difference being that the elastic ropes 15 are absent and the series of discharge members 6₁-6₆ is supplemented with a seventh, fixedly disposed discharge member 6₇. The function thereof is explained with reference to FIG. 8, which again shows two discharge members 6₂ and 6₃ associated with the brush channels 9₂ and 9₃ respectively. The positioning of the discharge members 6₂ and 6₃ relative to the associated brush channels 9₂ and 9₃ differs somewhat from the mutual positioning as shown in FIG. 4. Compared with FIG. 4, the discharge members 6₂ and 6₃ in FIG. 8 have shifted leftwards through a slight distance.

The structural variant shown in FIG. 8 operates as follows:

The eggs P fed at low speed V- and intended to be discharged into the brush channel 9₂, are discharged through energization of the discharge member 6₂ and follow the fall trajectory T-. The discharge of the eggs intended for the brush channel 9₂ by means of the associated discharge member 6₂ can take place until the speed of travel V- of the feed conveyor 1 reaches such a level that the eggs discharged at that speed run the risk of tilting over the left edge 10 of the brush channel 9₂ and ending up in the adjacent brush channel 9₁. At that speed of travel of the feed conveyor 1, and for higher speeds, the eggs intended for the brush channel 9₂ are discharged by means of the discharge member 6₃ associated with the brush channel 9₃. In FIG. 8, the fall trajectory of eggs P discharged at the high speed V+ of the feed conveyor 1 is indicated by T+. Through a proper positioning of the fixed discharge members 6₂ and 6₃, it can be achieved that the eggs which are discharged at a speed of travel up to about 70% of the maximum speed of travel of the feed conveyor 1, are discharged by means of the discharge member 6₂, while the discharge of eggs P which at the moment of discharge have a speed higher than about 70% of the maximum speed, are discharged by the fixed discharge member 6₃. It will be understood that this latter discharge member 6₃ is also energized during the discharge of eggs P intended for the brush channel 9₃, which eggs P at

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the moment of discharge have a speed which is 70% or less of the maximum speed of travel of the feed conveyor 1.

Finally, it will be understood that the discharge member 6₇ shown in FIGS. 5 and 7 is intended for discharging the eggs travelling at high speed V+ into the channel 9₆ of the brush belt 7. In the above-described variant, the number of fixed discharge members per track 2, 3 and 4 of the feed conveyor 1 is therefore increased by one.

The structural variant shown in FIGS. 9-11 differs from the one shown in FIGS. 5-7 only in that the number of fixed discharge members has been increased. The operation of this structural variant is specified with reference to FIG. 12. In this Figure, two discharge members 6_{2a} and 6_{2b} are shown, both associated with the brush channel 9₂. The discharge members 6_{3a} and 6_{3b} are associated with the brush channel 9₃. The discharge member 6_{2a} is controlled for discharging eggs travelling at a low speed V- at the moment of discharge. These eggs follow the fall trajectory T- and end up on the brush channel 9₂.

If the speed of travel of the eggs P at the moment of discharge exceeds a first limit value, the eggs P intended for the brush channel 9₂ are no longer discharged by means of the discharge member 6_{2a}, but by means of the discharge member 6_{2b}. The eggs discharged then follow the fall trajectory T.

If the machine speed of the egg-sorting apparatus, and hence the speed of travel of the feed conveyor, is further increased and exceeds a second limit value for the speed, the eggs intended for the brush channel 9₂ are discharged by means of the discharge member 6_{3a} associated with the following brush channel 9₃. The eggs P discharged then follow the fall trajectory T+. The same discharge member 6_{3a} is also controlled for discharging eggs P in the brush channel 9₃, if the speed of travel of the feed conveyor 1 is in the range between zero and the above-mentioned first limit value for the speed of travel.

As appears from FIG. 9, two discharge members 6_{1a}, 6_{1b} etc. are associated with each brush channel 9₁, 9₂ etc., while for each track 2, 3 and 4 of the feed conveyor 1, an extra discharge member has been added.

By using, in accordance with the structural variant of FIG. 12, three discharge members 6_{2a}, 6_{2b} and 6_{3a} per brush channel 9₂, 9₃, etc., the lateral distribution of the landing locations in the brush channel 9₂ is smaller than is the case in the structural variant according to FIG. 8. In the variant according to FIG. 8, the first and the second limit value for the speed of travel of the feed conveyor 1 are equal to each other and, hence, there is no third speed range, which, in the discussion of FIG. 12, is indicated as the speed range V.

The discharge members 6_{2a} and 6_{2b} shown in FIG. 12 and associated with the brush channel 9₂ each consist of an electric coil comprising a movable core whose end acts as unlocking pawl for an egg carrier. To limit the number of discharge coils, the coils of the discharge members 6_{2a} and 6_{2b} can be replaced by one single coil, whose movable core has its bottom side provided with a bar that extends in the direction of movement of the associated track and comprises two unlocking pawls for the respective discharge points associated with the fall trajectories T- and T. Through energization of this coil at different moments, one or the other unlocking pawl can be put into action, depending on the desired fall trajectory T- or T.

I claim:

1. A transfer apparatus for transferring separate products from a feed conveyor to a packaging apparatus, said transfer apparatus comprising:

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a feed conveyor having at least one track of product holders, said product holders being spaced apart in a direction of movement of the feed conveyor;

a receiving conveyor having brushes for receiving products discharged from the feed conveyor, said receiving conveyor having a substantially flat top face and arranged under the feed conveyor and having a direction of movement perpendicular to the direction of movement of the feed conveyor;

a feed-through conveyor, connecting to the receiving conveyor, for further conveying the products to a packaging apparatus;

means for influencing fall trajectory of products discharged from the feed conveyor, said means for influencing being arranged above said top face of the receiving conveyor and dividing said top face into a number of parallel channels extending in the direction of movement of the receiving conveyor; and

discharge members, fixedly arranged above the feed conveyor, the discharge members and said means for influencing the fall trajectory of discharged products being arranged so that products discharged from the feed conveyor by the same one of said discharge members are received in the same channel on the receiving conveyor independently of speed of travel of said feed conveyor at the moment of discharge.

2. The transfer apparatus according to claim 1 wherein the means for influencing the fall trajectory of products discharged from the feed conveyor comprises elastic ropes stretched above the top face of the receiving conveyor, the number of discharge members of the feed conveyor per track being equal to the number of said channels and each of said channels serving as a landing location for products discharged from the fixed discharge member associated with said channel.

3. A transfer apparatus for transferring separate products from a feed conveyor to a packaging apparatus, said transfer apparatus comprising:

a feed conveyor having at least one track of product holders, said product holders being spaced apart in a direction of movement of the feed conveyor;

a receiving conveyor arranged under the feed conveyor and having a direction of movement perpendicular to the direction of movement of the feed conveyor, and having brushes for receiving products discharged from the feed conveyor, said receiving conveyor having a substantially flat top face divided by extended brush hairs into parallel channels extending in the direction of movement of the receiving conveyor;

a feed-through conveyor, connecting to the receiving conveyor, for further conveying the products to a packaging apparatus; and

discharge members, fixedly arranged above the feed conveyor such that at least two fixed discharge members are associated with each of said channels, each of said channels serving as a landing location for products discharged from the at least two fixed discharge members associated therewith, a first fixed discharge member associated with a first channel discharging articles into the first channel at a speed of travel of the feed conveyor below a predetermined first speed, a discharge member associated with an adjacent preceding channel, viewed in the direction of movement of the feed conveyor, discharging articles into said first channel at a speed of travel of the feed conveyor above a predetermined second speed, and a second discharge

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member associated with said first channel discharging articles into said channel at a speed of travel ranging between the first and the second predetermined speeds.

4. An apparatus for conveying separate products comprising:

a variable speed feed conveyor having at least one track of product holders, the product holders being spaced apart in a direction of movement of the feed conveyor, said product holders constructed to selectively release separate products;

a receiving conveyor located beneath the feed conveyor and having a direction of movement substantially perpendicular to the direction of movement of the feed conveyor, the receiving conveyor having a movable product receiving surface which is sufficiently resilient to receive the separate products from the feed conveyor without damage thereto; and

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elongated resilient elements located above the surface of the receiving conveyor and extending parallel to the direction of movement of the receiving conveyor to form channels for released separate products, the elongated resilient elements being spaced apart a sufficient distance such that a separate product, when released at a given point along the direction of movement of the feed conveyor, falls between the same two elongated resilient elements independently of speed of the feed conveyor.

5. The apparatus according to claim 4 wherein said feed conveyor includes discharge members for discharging products from the product holders, a separate discharge member being associated with each of said channels.

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